UNIVERSITI PUTRA MALAYSIA

MANUFACTURING PLANNING AND CONTROL PRACTICES IN THE MALAYSIAN MANUFACTURING INDUSTRY

MAGDALENE ak. ANDREW MUNOT

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By

MAGDALENE ak. ANDREW MUNOT

Thesis Submitted in Fulfilment of the Requirement for the Degree of Master of Science in the Faculty of Engineering Universiti Putra Malaysia

February 2001

DEDICATION

Dadag;

Amang, Andu, Grace, Eric, Samson, Christopher, Michelle & Dominic

Ahi trima kaseh ndug kinde.....

Iti mah pingarun abih mamba kita....

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science.

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Chairman: **Dr. Shamsuddin Sulaiman, Ph.D.**

Faculty: **Engineering**

The marketplace in which manufacturing firms are operating becomes more competitive. The Malaysian manufacturers become more internationally competitive by outperforming their international competitors in terms of one or more of the competitive priorities. The previous studies show that the MPC practices of manufacturing firms are essential for achieving and leading to the success of the companies' performance and competitiveness. Currently there is lack of internationally published studies on the use of MPC practices in the Malaysian manufacturing industries, particularly studies on the extensiveness of MPC practices usage. It is very important to assess the current trend of MPC practices of the Malaysian manufacturers in order to establish how extensive they are using the MPC practices to meet the competitive demand of the marketplace.

The sample population was identified and selected from the Standard and Industrial Research Institute of Malaysia (SIRIM) 1999 Directory. The current information on MPC practices were gathered using the modified version of the Whybark and Rho (1993) survey questionnaire from the manufacturing firms across several industries. The survey questionnaires were distributed via mail to 870 manufacturing firms scattered all over Malaysia. Only, 86 manufacturers responded to this study, yielding a response rate of 9.9 per cent. The information provided by the manufacturers was analysed using the Statistical Package for the Social Science (SPSS).

The statistical data analysis shows that the manufacturers are customer-driven and responsive. They are extensively using a set of MPC practices that have been identified as essential for achieving and leading to the success of the companies' performance and competitiveness. They are also using the approaches for MPC practices which are similar to those used in other countries. Based on the Bivariate Correlations analysis, the factors taken into consideration are different depending on the specific MPC practice. The non-parametric Mann Whitney test, shows that there are differences due to firm size in several areas of the approaches for MPC practices.

For further improvement of their MPC practices and competitiveness, the Malaysian manufacturers are advised to use the approaches comprehensively. In future studies, more manufacturers should involve themselves. In addition, future studies should also be done on assessing the companies' performance and competitiveness.

Abstrak tesis yang dikemukan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

AMALAN PENGGUNAAN KAEDAH PERANCANGAN DAN KAWALAN PEMBUATAN DALAM INDUSTRY PEMBUATAN DI MALAYSIA.

Oleh

MAGDALENE ak. ANDREW MUNOT

Februari 2001

Pengerusi: **Dr. Shamsuddin Sulaiman, Ph. D.**

Fakulti: **Kejuruteraan**

Persekitaran pasaran di mana kilang - kilang pembuatan beroperasi semakin kompetitif. Dengan mengalahkan pesaing – pesaing antarabangsa di dalam salah satu atau beberapa bidang kepentingan kompetitif, pengilang – pengilang di Malaysia menjadi lebih kompetitif. Kajian menunjukkan bahawa amalan penggunaan kaedah perancangan dan kawalan pembuatan adalah penting untuk mencapai prestasi kilang yang sukses dan kompetitif. Walau bagaimanapun, masa kini terdapat kekurangan pada penerbitan di peringkat antarabangsa tentang kajian amalan penggunaan kaedah perancangan dan kawalan pembuatan di Malaysia, terutamanya kajian tentang keluasan penggunaan kaedah tersebut. Oleh yang demikian adalah penting untuk menilai corak semasa amalan penggunaan kaeadah perancangan dan kawalan pembuatan yang diamalkan oleh pengilang – pengilang di Malaysia untuk memenuhi kehendak persekitaran pasaran yang kompetitif.

Sample populasi untuk penyelidikan ini adalah kilang – kilang pembuatan yang telah dipilih dari buku panduan Institut Penyelidikan dan Standard Malaysia (SIRIM) keluaran 1999. Maklumat yang berkaitan dengan amalan penggunaan kaedah perancangan dan kawalan telah dikumpul dari pengilang – pengilang dengan menggunakan soalan kaji selidik Whybark dan Rho (1993). Soalan kaji selidik tersebut telah diposkan kepada 870 kilang - kilang yang beroperasi di seluruh Malaysia. Sebanyak 86 buah kilang telah memberi respons kepada penyelidikan ini menjadikan kadar respons sebanyak 10.1 peratus. Maklumat yang diberikan oleh pihak pengilang – pengilang telah dianalisis secara statistik.dengan menggunakan Statistical Package for the Social Science (SPSS).

Keputusan dari penganalisisan data menunjukkan bahawa pengilang – pengilang yang terlibat dalam penyelidikan ini memenuhi kehendak pengguna dan responsif. Mereka juga mengamalkan secara meluas kaedah perancangan dan kawalan pembuatan yang telah dikenalpasti sebagai penting untuk mencapai prestasi kilang yang sukses dan kompetitif. Meraka juga menggunakan kaedah yang sama seperti kadeah yang digunakan di negara – negara lain. Bivariate Correlation analisis menunjukkan bahawa bergantung pada sesuatu kaedah faktor – faktor yang diambil kira adalah berlainan. Ujian non – parametric Mann Whitney menunujukkan terdapat perbezaan pada beberapa penggunaan amalan kaedah perancangan dan kawalan pembuatan yang disebabkan oleh perbezaan sais kilang.

Untuk lebih memajukan amalan kaedah perancangan dan kawalan dan lantas menjadi lebih kompetitif, adalah disarankan agar pengilang – pengilang mengamalkan secara meluas kaedah perancangan dan kawalan pembuatan yang telah dikenalpasti di dalam kajian ini. Kajian pada masa akan datang haruslah melibatkan lebih ramai pengilang dan juga menilai prestasi dan tahap kompetitif kilang – kilang di Malaysia.

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I certify that an Examination Committee met on 19th February 2001 to conduct the final examination of Magdalene ak. Andrew Munot on her Master of Science thesis entitled "Manufacturing Planning and Control Practices in the Malaysian Manufacturing Industry" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee has recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

SHAMSUDDIN SULAIMAN, Ph. D
Associate Professor
Faculty of Engineering
University Putra Malaysia
(Chairman)

MD YUSOF ISMAIL, Ph. D
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Member)

MEGAT MOHAMAD HAMDAN MEGAT AHMAD, Ph.D
Faculty of Engineering
Universiti Putra Malaysia
(Member)

MOHD RASID OSMAN, M. Sc.
Faculty of Engineering
Universiti Putra Malaysia
(Member)

ROSNAH MOHD. YUSUFF, M. Sc.
Faculty of Engineering
Universiti Putra Malaysia
(Member)

MOHD. GHAZALI MOHAYIDIN, Ph.D,
Professor
Deputy Dean of Graduate School,
Universiti Putra Malaysia

Date: 13 MAR 2001

This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the requirement for the Degree of Master of Science.

MOHD. GHAZALI MOHAYIDIN, Ph.D.
Professor
Deputy Dean of Graduate School
Universiti Putra Malaysia

Date:

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

Signed

Name; Magdalene ak. Andrew Munot

Date: 12/03/2001

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LIST OF ABBREVIATIONS

BOM : bill of material

MLT : manufacturing lead time

MPC : manufacturing planning and control

MPS : master production schedule

MRP : materials requirement planning

PAC : production activity control

SFC : shop floor control

CHAPTER 1

INTRODUCTION

1.1 The Changing Competitive World

Harrison (1997) and Howard *et. al.* (1998) agree that the marketplace in which a manufacturing firm operates is becoming more competitive with the increasing threat from international competition and customer demands for swift-on-time delivery, consistent quality, low cost manufacturing, customer specified design product and functionality. In addition according to Newman and Sridharan (1995) there are pressures on most manufacturing firms to excel in a variety of dimension such as quicker product development, wider variety of products and wider range of production volumes. Harrison (1997) points out that these competitive priorities (on time and reliable delivery, consistent quality, low cost manufacturing, customer specified design product and functionality, quicker product development, wider variety of products and wider range of production volumes) are now seen as 'qualifiers' in the race for leadership – in the sense that they are the minimum levels of customer service required to compete effectively. To be competitive at the international level, Malaysian manufacturers must offer products that are internationally competitive (Fong, 1986).

Changes in the marketplace environment drive revisions in a firm's strategy which in turn call for changes in the manufacturing strategy, manufacturing processes and manufacturing planning and control (MPC) system (Vollman *et. al.*, 1997). According to Krawjeski and Ritzman (1998), a firm competing based on customer driven manufacturing strategy identifies which customers it wants to serve and their corresponding needs. The firm then, must develop its competitive priorities or capabilities and strength that it must possess to meet the demand. By outperforming competitors in terms of one or more of these competitive priorities, the firm gains advantage with its operating system. These possible competitive priorities are Cost (low cost operations), Quality (high performance design, consistent quality), Time (fast delivery time, on time delivery, development speed), and Flexibility (customisation, volume flexibility).

The MPC systems have been established for some time as being central to the success of modern manufacturing companies. Its role is essential in linking the activities on the shop floor and the availability of materials and machinery with the demands of the appropriate markets and strategy of the company (Howard et. al., 1999). According to Wacker and Hanson (1997), the MPC system of a manufacturing company is define as comprising of the planning (sales forecasting and production planning and scheduling) and control (shop floor control and purchasing and materials management) activities.

1.2 Manufacturing Planning and Control Activities and Practices

Sales forecasting activities establish a basis for determining what to manufacture, what to stock or what to ship (Lines, 1996). After the customer's order has been estimated, a production plan needs to be established, taking into account of the firm's capacity limitations (Krajewski and Ritzman, 1998; Handfield and Withers, 1993). The master production schedule (MPS) then breaks down this production plan requirements for the individual end items, in each family, by date and quantity (Tony-Arnold, 1998).

The shop floor control (SFC) otherwise known as production activity control (PAC) is then responsible for executing or implementing the MPS, at the same time making good use of the labour and machine capacity, minimising work in process inventory and maintaining customer service (Tony-Arnold, 1998). The purchasing and materials management activities includes a wide range of activities associated with purchasing, managing, distributing and controlling inventories within the plant (Whybark and Rho, 1993).

Previously conducted studies (Golden *et. al.*,1994; Greene, 1987; Hadfield and Withers, 1993; Hagdorn van-der Meijden *et. al.*, 1994; Herbig *et. al.*, 1994; Howard *et. al.*, 1999; Kadipasoglu *et. al.*, 1998; Krajewski and Ritzman, 1998; Lines, 1996; Lin-Pan and Kleiner, 1995; Narasimhan *et. al.*, 1995; Rho and Yu, 1998; Smith III *et. al.*, 1996; Szwekczewski *et. al.*, 1997; Tony-Arnold, 1998; Tracey and Vonderembse, 1998; Vollman *et. al.*, 1997; Wacker and Hanson, 1997; Wacker and Sprague, 1998; Whybark, 1993; Whybark, 1994; Winklhofer and Diamantopoulos, 1996; Zapfel, 1996; Zeng and Hayya, 1999), showed that MPC practices in the areas of sales forecasting activity, production planning and scheduling activity, shop floor control activity and purchasing and materials management activity are essential for achieving and leading to successful company performance and competitiveness. Detail discussions of these studies are presented in the literature review chapter and also these studies are summarised and presented in Table 1 in Appendix A.

1.3 Importance of the Study

The Malaysian government in its effort to meet the demand of the competitive world has launched several plans aim at improving Malaysia's competitiveness in the global world. The Industrial Master Plan 2 (IMP2), launched on the 28th November 1996, sees the manufacturing sectors as a mean for propelling Malaysia into the 21st century as an industrialised, advance and competitive nation (IMP2, 1996).

As previously mentioned, to be competitive at the international level, Malaysian manufacturers must offer products that are internationally competitive. This requires them to develop their competitive priorities and strength in several areas related to the product to meet their international customers' demand. By outperforming their international competitors in terms of one or more of the competitive priorities (Cost, Quality, Time and Flexibility), the Malaysian manufacturers gain an advantage with its operating system. In other words by outperforming their international competitors in terms one or more of the competitive priorities, Malaysian manufacturers gain an advantage or become more internationally competitive.

As pointed out earlier, previous studies showed that MPC practices are essential for achieving and leading to successful company performance and competitiveness. Therefore, the MPC practices of the Malaysian manufacturers are also essential for achieving and leading to the successful performance and competitiveness of their companies.

Currently, there is a lack of internationally published studies or literature on the usage of MPC practices in the Malaysian manufacturing industries, particularly studies on the extensiveness of MPC practices usage. As previously mentioned, MPC practices are essential for achieving and leading to successful company performance and competitiveness. Therefore, it is very important to assess the current trend of MPC practices of the Malaysian manufacturers in order to establish how extensive they use well-known MPC practices to meet the competitive demand of the marketplace. Through the survey instrument the manufacturers are able to assess their usage extent of these well-known MPC practices.

Thus, this study would be of tremendous value to the academicians by contributing towards theory building in the area of manufacturing planning and control. In addition, this study is of great value to the manufacturers by providing more information on well-known MPC practices and the extensity usage of these well-known MPC practices. To the author's best knowledge, this would be the first manufacturing planning and control practices study carried out in the Malaysian manufacturing industries at this level and scope.

1.4 Objectives of the Study

This study aims at assessing the current trend of MPC practices of Malaysian manufacturing firms in order to establish how extensive they use well-known MPC practices to meet the competitive demand of the marketplace. The objectives of this study are as the following:

1. To identify and evaluate the current trend of manufacturing planning and control practices in the Malaysian manufacturing industry.
2. To investigate the correlationship between the main external or internal factors and the use of a specific manufacturing planning and control practices.
3. To investigate the difference due to firm size in the use of a specific manufacturing planning and control practice.

1.5 Scope of the Study

This study assesses the current trend of MPC practices approaches of the Malaysian manufacturers in four main areas namely, sales forecasting, production planning and scheduling, shop floor control and purchasing and materials management. For example, this study investigate what are the most popular forecasting techniques (approaches), what are the factors (approaches) that are taken into consideration when preparing the forecast and is the use the Times Series for forecasting is practice to a different extent in 'Small/Medium' and 'Large' firms.